INSTRUCTION MANUAL

MODEL 13116-2A
X-Y DISPLAY

SPECTRAL DYNAMICS CORPORATION

SERIAL 168

INSTRUCTION MANUAL

MODEL 13116-2A
X-Y DISPLAY

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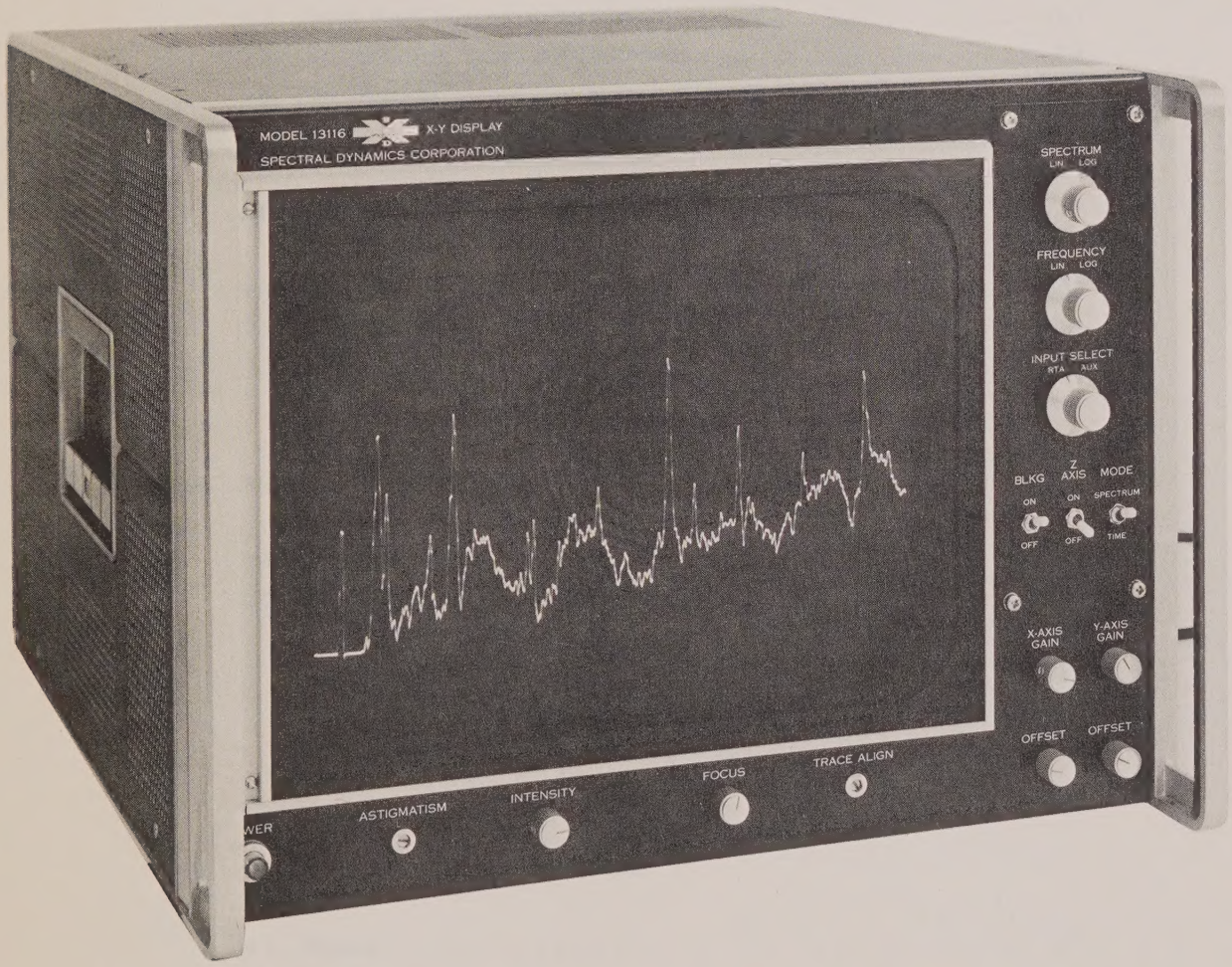
June 1973

CAUTION

1. Do not display an undeflected bright spot. This action can cause the cathode-ray tube face to be permanently damaged with black burned spots.

2. Do not defocus (turn FOCUS control counter-clockwise) beyond the point of optimum focus. This action can cause mesh burns. Mesh burns cause geometric distortion of the displayed trace in the vicinity of the burn.



MODEL 13116-2A X-Y DISPLAY

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LIST OF DRAWINGS

(Located at Rear of Manual)

Schematic and Component Layout Drawings:

Circuit Card(s)	Description	DWG. NO.
A2	Output Amplifiers	10065900
A4 and A5	High Voltage Power Supply	10066000
A6 and A7	Low Voltage Power Supply	10066100
	Interconnect Diagram	10061700

PREFACE

RECEIVING INSPECTION PROCEDURE

The Model 13116-2A X-Y Display unit is shipped fully assembled, packed in a polystyrene case designed to protect it against all normal shipping hazards. Immediately upon receipt, inspect the exterior of the shipping case and note any visible damage. Keep all forms and invoices attached to the shipping case. Remove the instrument from the shipping case and test its functional operation. If shipping damage is apparent, file a claim with the carrier's claims agent and send a copy to Spectral Dynamics Corporation. Be sure to include the instrument name, model number, and serial number on all correspondence. Spectral Dynamics Corporation will advise the buyer what should be done; arrangements for repair or replacement will be made as applicable.

WARRANTY POLICY

All Spectral Dynamics products are warranted against defects in materials and workmanship. This warranty applies for one year from the date of delivery, or, in the case of certain components listed in some of the operating manuals, for the specified period. We will repair or replace products which prove to be defective during the warranty period, providing the failure or damage has not been caused by misuse or abnormal operating conditions. Fuses and lamps are specifically excluded from warranty. If the malfunction or a portion thereof is determined by Spectral Dynamics Corporation to have been caused by misuse or abnormal conditions of operation, an estimate of cost to repair will be submitted to the purchaser for approval before beginning any repair work.

Liability under this warranty is limited to servicing and adjusting the instrument returned to the factory, with transportation charges prepaid by the purchaser. No other warranty is expressed or implied. We are not liable for consequential damages.

If any malfunction develops, notify Spectral Dynamics Corporation or its representative in your area, giving details of the problem, and the name, model and serial number of the equipment. Upon receipt of this information, service data or shipping instructions will be provided.

RETURN SHIPMENT PROCEDURE

On receipt of shipping instructions, forward the instrument prepaid via air freight to the factory or authorized repair station indicated on the instructions. Replace the instrument in its original shipping case, or surround with two to three inches of shock absorbing material and then pack it in a heavy-weight cardboard box, wooden box, or other strong container.

SECTION I

GENERAL INFORMATION

1.1 INTRODUCTION

The Model 13116-2A X-Y Display unit is a large-screen display oscilloscope. It was specifically designed for displaying the outputs of instruments such as the Model SD301 series of Real Time Analyzers, the Model 13151 Spectrogram Display Control unit, the Model 13178 Time-Gram Adaptor, and other similar equipments that provide X and Y axes data. (The Model 13116-2A has no internal sweep generating circuits.)

The spectrum is displayed on an 8-inch (vertical) by 10-inch (horizontal) display CRT; an 8-inch by 10-inch graticule over the scope face is divided into 1-inch squares, with subdivisions of 0.2 inch along the major axes. All controls for adjusting the size, quality, and position of the display are located on the front panel. In addition, two complete sets of inputs (X, Y, and Z data) are front-panel selectable. All inputs signals are accepted by BNC-type connectors located on the rear of the chassis.

Figure 1-1 shows the Model 13116-2A in a typical application. Here, by switching the front-panel INPUT SELECT switch to RTA or AUX, the output spectra from the RTA (or averaged spectrum from the Ensemble Averager) can be viewed, or an octave band spectrum analysis from the Octave Converter can be observed. Also, by selecting the TIME MODE on the 13116-2A, the RTA INPUT data, in time format, will be displayed.

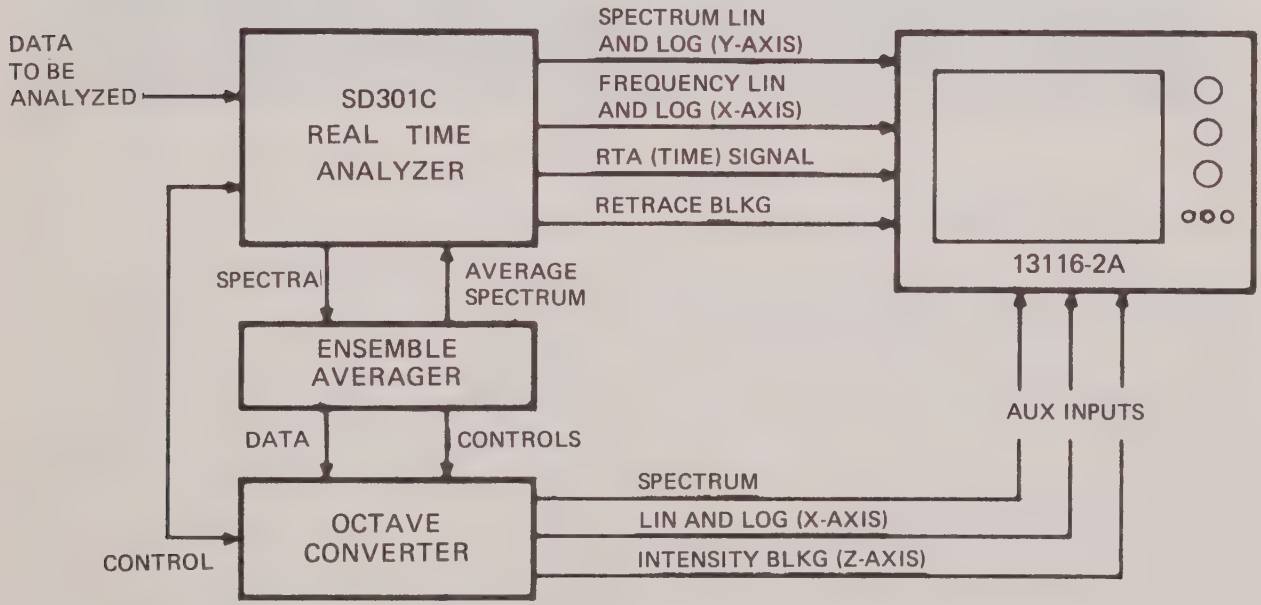


Figure 1-1. Model 13116-2A in Typical Application

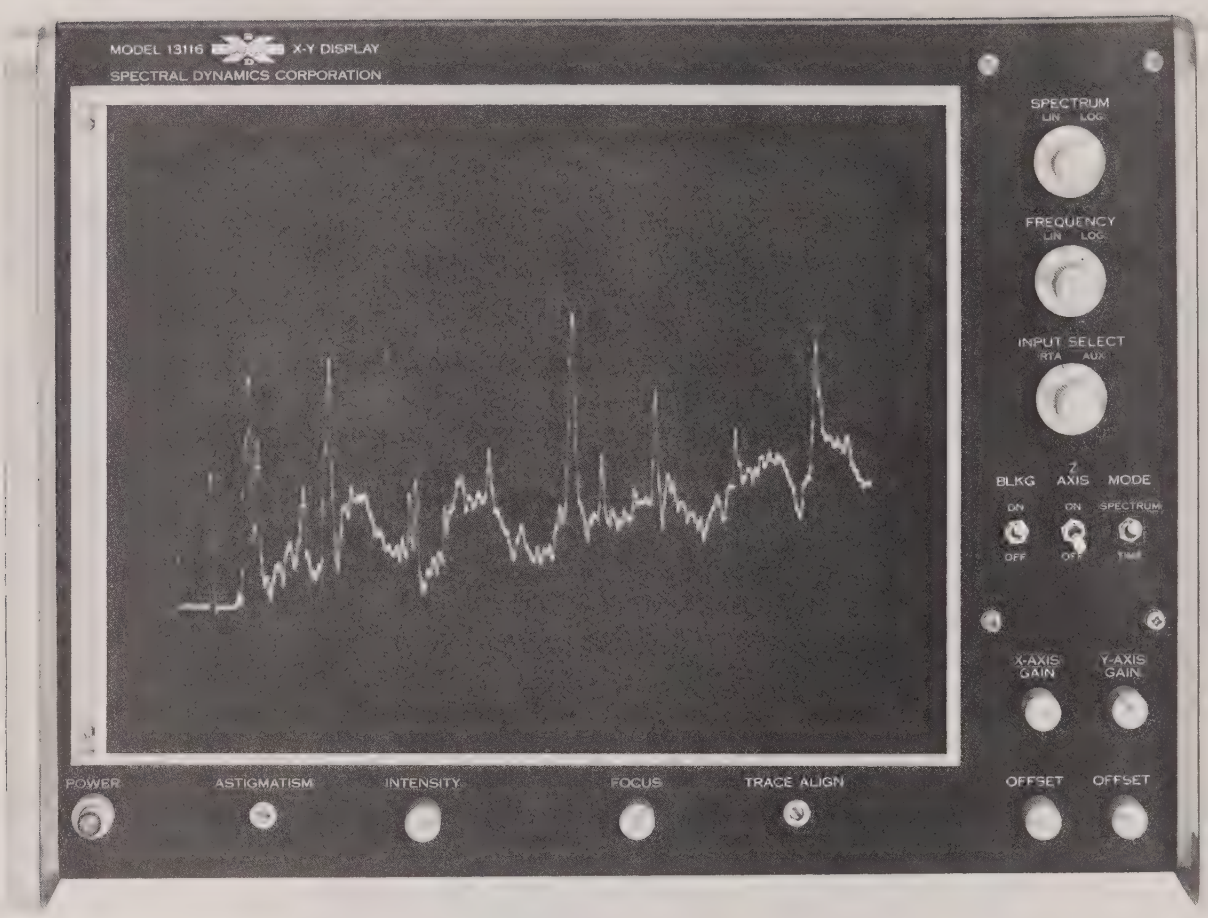


Figure 1-2. Front Panel

1.2 FRONT PANEL FUNCTIONAL DESCRIPTION

The following paragraphs provide a brief functional description of each control, switch, and indicator on the instrument front panel, shown in Figure 1-2.

POWER Push Button Switch/Indicator

Press to turn X-Y Display unit power on or off; lighted when power is on.

X-Y Display Scope

The scope graticule is 8 inches vertical by 10 inches horizontal, divided into 1-inch squares with 0.2-inch subdivision marks on the major axes.

ASTIGMATISM Screwdriver Adjust

Adjusts the roundness of a single spot display; used with the FOCUS control to achieve the best display. (Normally used only during calibration.)

INTENSITY Control

Adjusts the brightness of the display; turn clockwise for brighter display.

FOCUS Control

Focuses the trace lines for displaying sharpest details. (Refer also to the ASTIGMATISM control.)

TRACE ALIGN Screwdriver Adjust

Aligns the horizontal trace lines so they are parallel to the horizontal graticule lines. (Normally used only during calibration.) See also ORTHOG screwdriver adjust in rear-of-chassis description.

Display Select Switch Group

This group comprises the MODE, INPUT SELECT, SPECTRUM, FREQUENCY, BLKG, and Z AXIS switches. These switches allow the operator to select a desired display in various combinations from the multiple X, Y, and Z inputs that can be applied to the rear-of-chassis input connectors. As an aid to understanding the overall operation of these switches, see Figure 3-1 in Section III of this manual.

NOTE

The following descriptions assume that suitable input signals are applied to all rear-of-chassis input connectors. Typical input signals are shown in Figure 1-1.

MODE TIME/SPECTRUM Switch

In the TIME MODE, the X-Y display is a time format of the RTA INPUT SIGNAL (J111). The X-axis sweep is the LIN X INPUT, either RTA (J101) or AUX (J106) as selected by the INPUT SELECT switch. (The Z AXIS and BLKG switches, described later, also affect the display in this mode.)

In the SPECTRUM MODE, the X-Y display is controlled by the settings of the following switches:

INPUT SELECT RTA/AUX Switch

Setting determines which group of inputs, RTA or AUX, can be selected for display. Further selection is afforded by the SPECTRUM, FREQUENCY, BLKG, and Z AXIS switches described in the following paragraphs.

SPECTRUM LIN/LOG Switch

Selects the Y-INPUT LIN or LOG (RTA or AUX as selected by the INPUT SELECT switch) for application to the Y-axis deflection amplifier. A variable voltage divider circuit is connected in series with the LIN input circuit to normalize the 5V full-scale LIN input to the 1V full-scale LOG input. (The potentiometer is mounted internally on the back of the SPECTRUM LIN/LOG switch.)

FREQUENCY LIN/LOG Switch

Selects the X-INPUT LIN or LOG (RTA or AUX as selected by the INPUT SELECT switch) for application to the X-axis (sweep) deflection amplifier. A variable voltage divider circuit is connected in series with the LIN input circuit to normalize the 5V full-scale LIN input to the 1V full-scale LOG input. (The potentiometer is mounted internally on the back of the FREQUENCY LIN/LOG switch.)

BLKG ON/OFF Switch

Used to turn ON or OFF the RTA or AUX BLANKING input signal selected by the INPUT SELECT switch.

Z AXIS ON/OFF Switch

Used to turn ON or OFF the RTA or AUX Z INPUT signal selected by the INPUT SELECT switch.

X-AXIS GAIN and OFFSET Controls

GAIN varies the gain of the X amplifier; provides 2.5:1 range of adjustment (from 0.1V/inch to 0.25V/inch).

OFFSET (below X-AXIS GAIN) positions display lines horizontally.

Y-AXIS GAIN and OFFSET Controls

GAIN varies the gain of the Y amplifier; provides 2.5:1 range of adjustment (from 0.1V/inch to 0.25V/inch).

OFFSET (below Y-AXIS GAIN) positions display lines vertically.

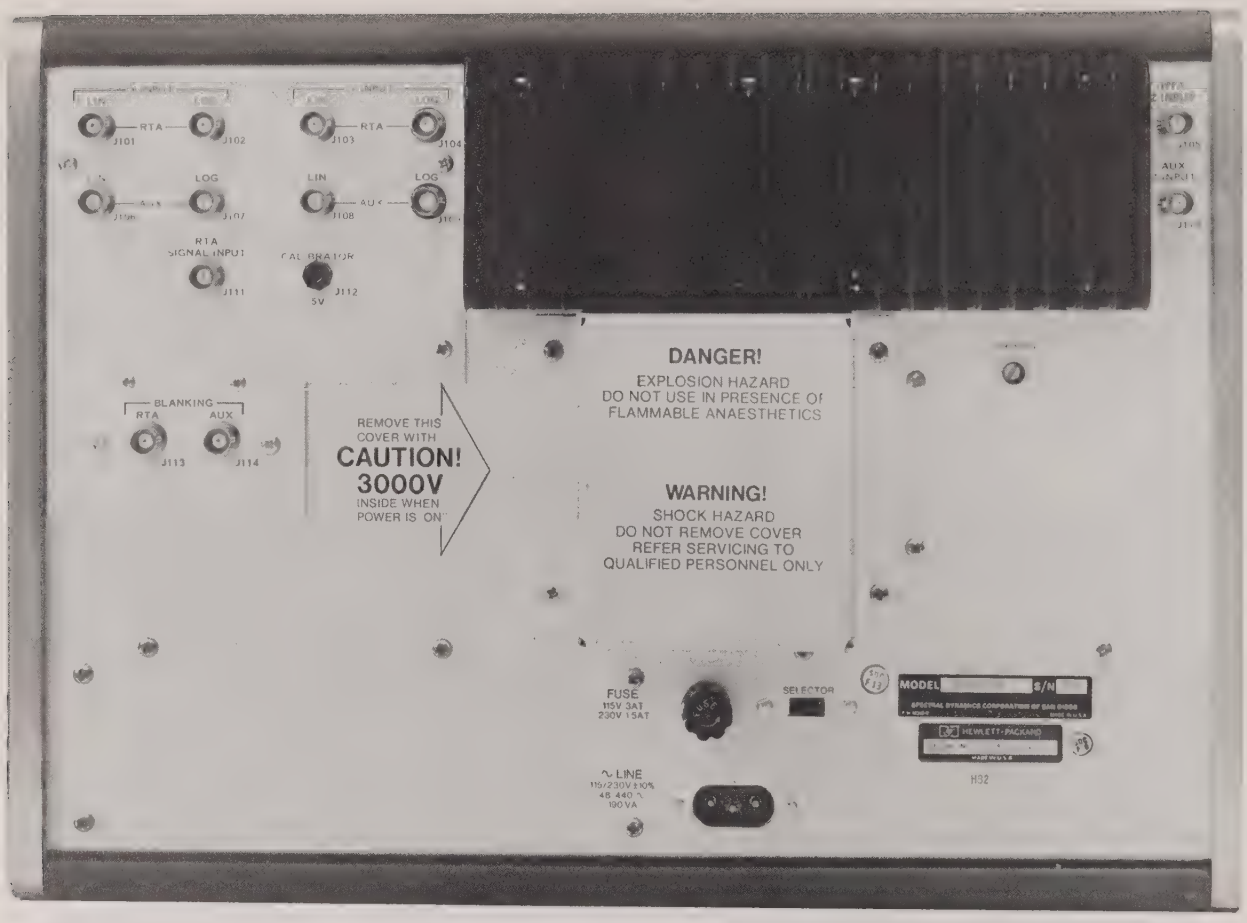


Figure 1-3. Rear of Chassis

1.3 REAR-OF-CHASSIS FUNCTIONAL DESCRIPTION

The following paragraphs provide a brief functional description of each control, connector, and fuse on the rear of the chassis, shown in Figure 1-3. For each input function (X, Y, Z, and BLANKING), there are two sets of input connectors, RTA and AUX. The input characteristics of corresponding connectors are identical; therefore, only the RTA connectors are described.

X-INPUT: RTA LIN (J101), RTA LOG (J102)

Accept the FREQUENCY LIN and LOG OUTPUTS from an SD301 (series) RTA for selection and then application to the X-axis deflection amplifier. Full-scale RTA LIN input is +5V, and RTA LOG input is +1V.

Y-INPUT: RTA LIN (J103), RTA LOG (J104)

Accept the SPECTRUM LIN and LOG OUTPUTS from an SD301 (series) RTA for selection and then application to the Y-axis deflection amplifier. Full-scale RTA LIN input is +5V, and RTA LOG is +1V.

RTA Z-INPUT (J105)

Full-scale input is +1V for full intensity; –1V input for blanking.

RTA BLANKING (J113)

Zero volts or open circuit provides normal CRT intensity; +5V required for retrace blanking.

RTA SIGNAL INPUT (J111)

Accepts the RTA (time, raw data) signal for display in the TIME MODE. In TIME MODE, the input at J111 is applied to the Y-axis deflection amplifier, and a selected LIN X INPUT (RTA or AUX) is applied to the X-axis amplifier. (This connector does not have an AUX counterpart.)

ORTHOG Screwdriver Adjust

Used in conjunction with the TRACE ALIGN adjust (front panel) to adjust the perpendicularity of the X and Y traces.

CALIBRATOR (J112)

Provides a 0.5V p-p squarewave signal at the line frequency.

115/230 Switch

Allows changeover of primary power input circuit for either 115V or 230V operation. Proper input voltage to be applied shows in window.

FUSE

Contains 3AG type, SLO-BLO fuse; 3A for 115V or 1.5A for 230V operation.

POWER IN

Accepts 3-wire plug and cable (supplied) for applying 115/230 Vac 50–400 Hz primary input power. Center terminal is chassis ground. Accepts Belden No. 17258-S cable.

1.4 SPECIFICATIONS

INPUTS

SINGLE INPUT

. . . Data signal (time history)

DUAL INPUTS

From RTA

. . . Spectrum lin and log
. . . Frequency lin and log

From AUX

. . . Spectrum lin and log
. . . Frequency lin and log

From RTA and AUX

. . . Z input: +1V for full intensity
−1V for blanking

. . . Blanking: accepts open circuit signal for normal CRT intensity or +5V for retrace blanking

SETTLING TIME

. . . Less than 7 μs to within a trace width of final value.

REPEATABILITY

. . . Less than 0.15% error for re-addressing a point from any direction.

LINEARITY

. . . ±1% of full screen over 8 x 10-inch screen; any inch with respect to any other inch, within 10%.

CATHODE RAY TUBE

Accelerating Potential

... 20 kilovolts

Writing Rate

... Greater than 20 inches per μs

Spot Size

... Less than 30 mils throughout 8 x 10-inch screen at 100 foot-lamberts light output; nominally 20 mils at center screen (shrinking raster).

Phosphor and Graticule

... Aluminized P31 phosphor with 8 x 10-inch graticule

CONTROLS, FRONT PANEL

... Push button POWER on-off switch; screwdriver adjust ASTIGMATISM, TRACE ALIGN; control knobs for X-AXIS GAIN and OFFSET, Y-AXIS GAIN and OFFSET, INTENSITY and FOCUS; rotary switches for SPECTRUM LIN/LOG, FREQUENCY LIN/LOG, and INPUT SELECT RTA/AUX selection; toggle switches for BLKG ON/OFF, Z-AXIS ON/OFF, and MODE SPECTRUM/TIME.

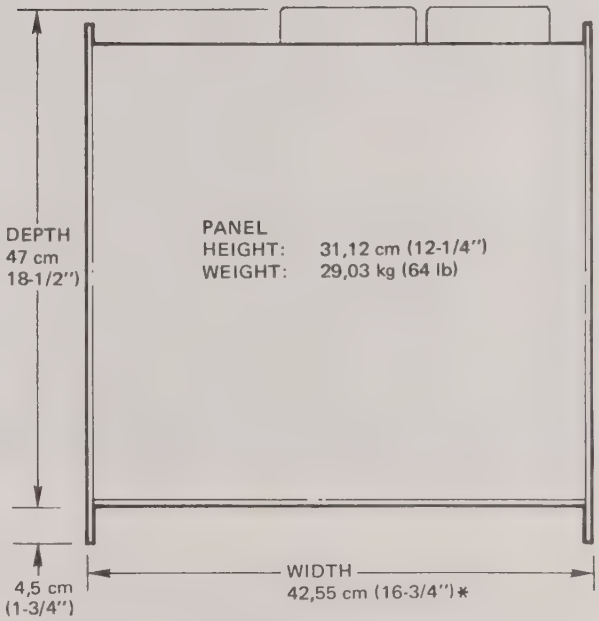
COOLING

... The Model 13116-2A does not contains a fan; therefore, if it is installed in a confined area such as a rack containing other equipment, external cooling is recommended and may be required.

POWER

... 105–125/210–250 Vac (switch selectable); 50 to 400 Hz; approximately 175 watts.

DIMENSIONS:



* Rack-mount hardware supplied for std. 19-inch rack mounting.

SECTION II

OPERATION

2.1 GENERAL

The Model 13116-2A provides a large-screen display of the outputs from units such as the SD301 series of Real Time Analyzers, the 13151 Spectrogram Display Control unit, the SD305A Octave Converter, and other similar equipments that output both X and Y axes data. (The 13116-2A has no internal sweep generating circuits.)

2.2 INITIAL POWERING

CAUTION

Before applying primary power to the instrument, be sure that the 115/230 switch on the rear of the chassis is set properly, and that the correct fuse is installed in the fuse holder.

a. Connect the power cord to the primary power source.

b. Press the POWER push button on the front-panel; it should light to indicate power is applied.

c. Allow at least a 10-minute warmup before operating the instrument.

2.3 OPERATION

Before operating the instrument, it is recommended that the operator study carefully the functional descriptions of the front-panel and rear-of-chassis controls, indicators, and connectors given in Paragraphs 1.2 and 1.3 in Section I of this manual.

The Model 13116-2A can be used in any number of applications. A typical application, using the versatility of its multiple inputs, is shown in Figure 2-1. A preliminary adjustment of the display can be made as follows:

a. Interconnect the 13116-2A and SD301 RTA as shown in the upper portion of Figure 2-1.

b. Apply power to both units and allow at least a 10-minute warmup.

c. On the 13116-2A, set both FREQUENCY and SPECTRUM selectors to LIN, INPUT SELECT to RTA, MODE to SPECTRUM, and BLKG to ON.

d. Place SD301 in CAL mode and provide a full-scale SPECTRUM signal to the 13116-2A.

e. On the 13116-2A, adjust the Y-AXIS GAIN and OFFSET controls for the desired amplitude display on the CRT.

f. Adjust SD301 to supply internal frequency markers.

g. On the 13116-2A, adjust the X-AXIS GAIN and OFFSET controls so that the horizontal sweep is contained within the graticule pattern.

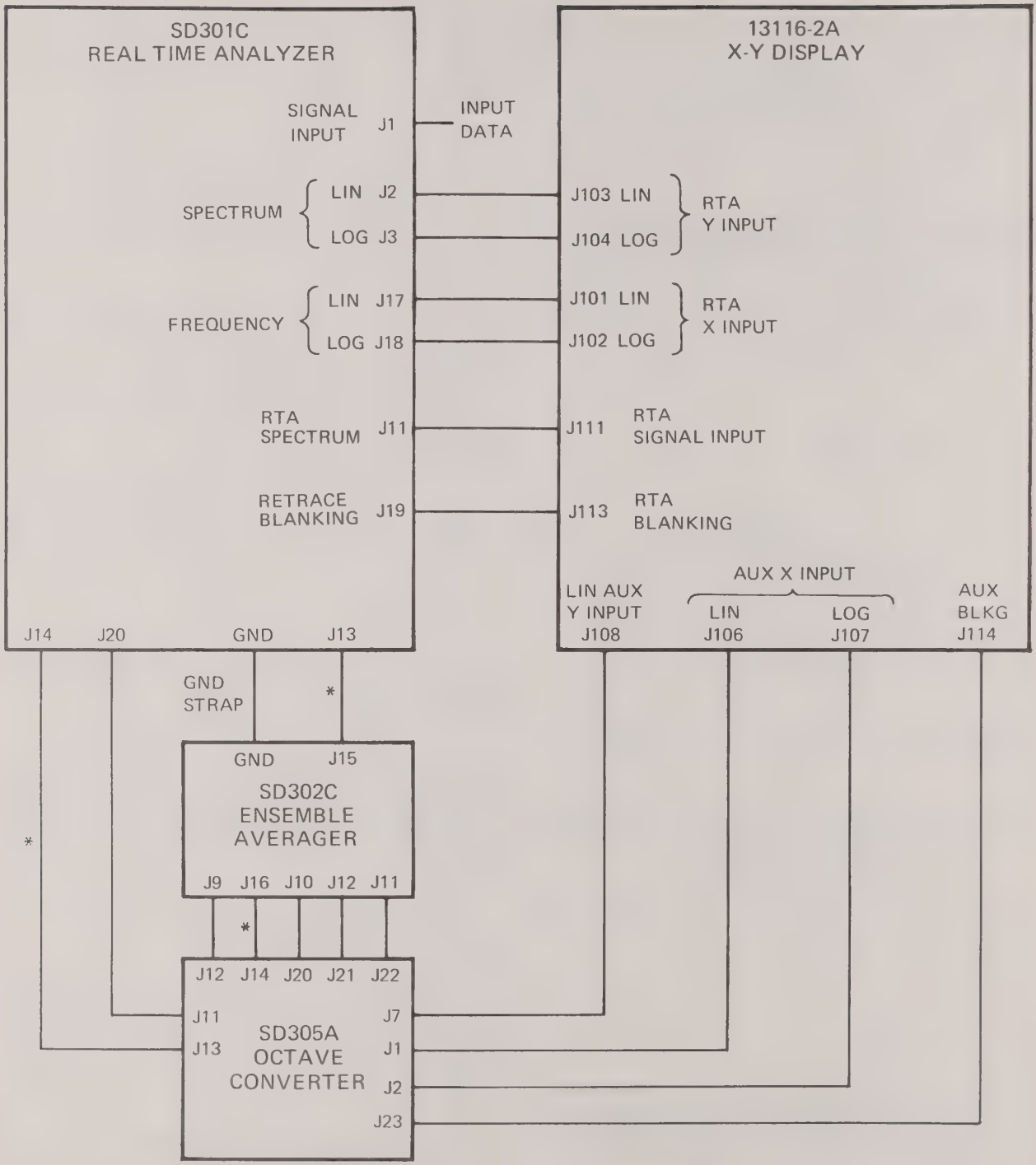
h. If necessary, adjust TRACE ALIGN so that the X-axis sweep base-line is parallel to the horizontal graticule line. Also, if required, adjust the ORTHO control on the rear of the chassis for proper perpendicularity of the pattern lines.

i. Adjust ASTIGMATISM, INTENSITY, and FOCUS as necessary for the best display.

j. To check the LOG signal display, set the SPECTRUM switch to LOG; observe that the relative amplitudes are the same as for the LIN signal input. Set the FREQUENCY switch to LOG, and observe a log sweep presentation on the CRT.

k. For a time signal display, set the MODE switch on the 13116-2A to TIME.

If the setup shown in Figure 2-1 or a similar setup can be interconnected, using both the RTA and AUX inputs, the INPUT SELECT switch can be set to AUX for viewing the associated AUX inputs. (Be sure that the MODE switch is set to SPECTRUM for all modes except TIME.)



* MULTIPLE WIRE CABLE ASSEMBLY; REFER TO APPLICABLE INSTRUCTION MANUAL. ALL OTHER CABLES ARE COAXIAL (50 OHM, SUCH AS RG-58/U) WITH BNC-TYPE CONNECTORS ON EACH END.

Figure 2-1. Typical System Interconnect

SECTION III

THEORY OF OPERATION

3.1 FUNCTIONAL DESCRIPTION (See Figure 3-1.)

The Model 13116-2A employs a wide-band, large-screen oscilloscope consisting of low and high voltage power supplies, and X, Y, and Z output amplifiers. The selected RTA or AUX, LIN or LOG X and Y inputs, along with Z AXIS and BLANKING inputs are fed to the output amplifiers. The X and Y output (deflection) amplifiers accept the single-ended inputs and provide differential drive to the CRT horizontal and vertical deflection plates.

The LV (low voltage) power supply provides regulated d-c operating voltages to all the amplifier circuits and to the HV (high voltage) power supply. The high voltages for the CRT are generated by an oscillator-type power supply operating at approximately 20 kHz. Multiple windings on the HV transformer provide the -3 kV and -2.95 kV supplies, and ≈4.25 kV which is quadrupled to provide the +17 kV post accelerator voltage for the CRT.

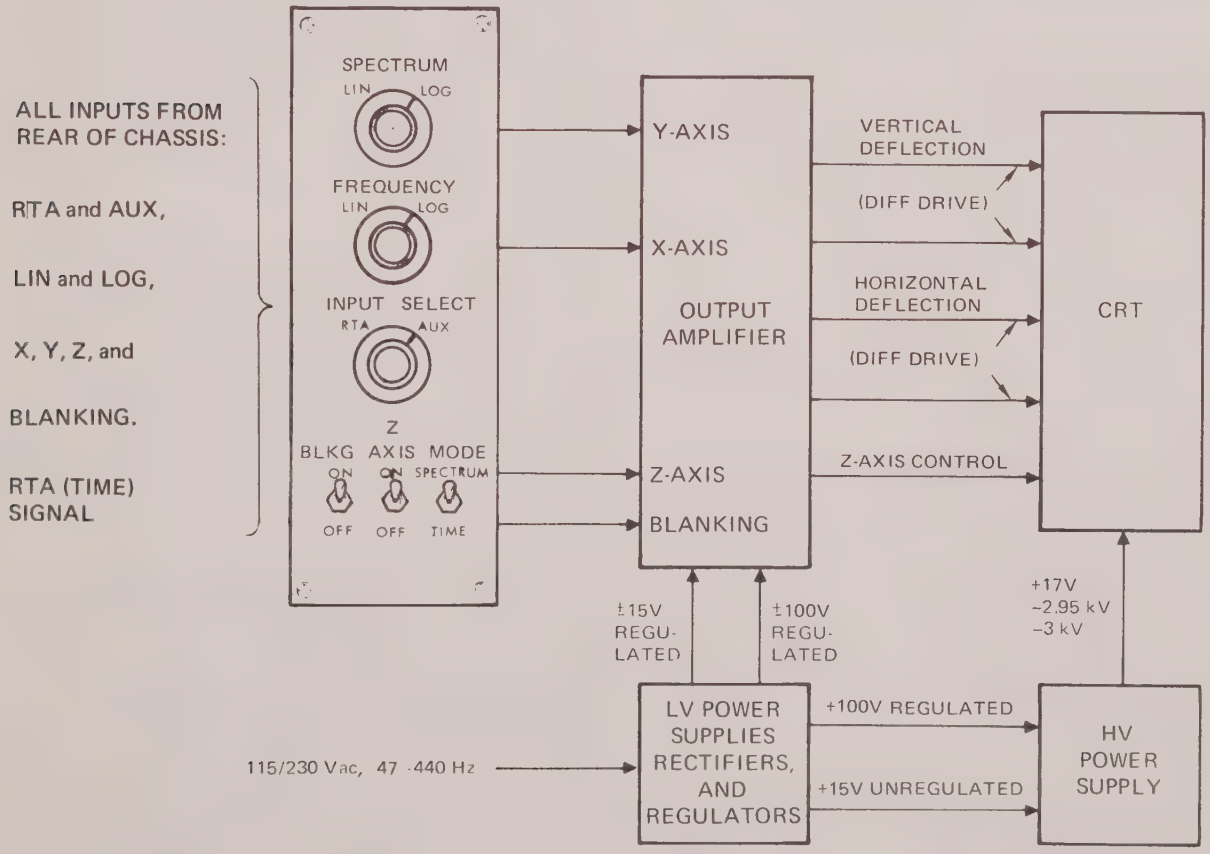


Figure 3-1. Functional Block Diagram, Model 13116-2A X-Y Display

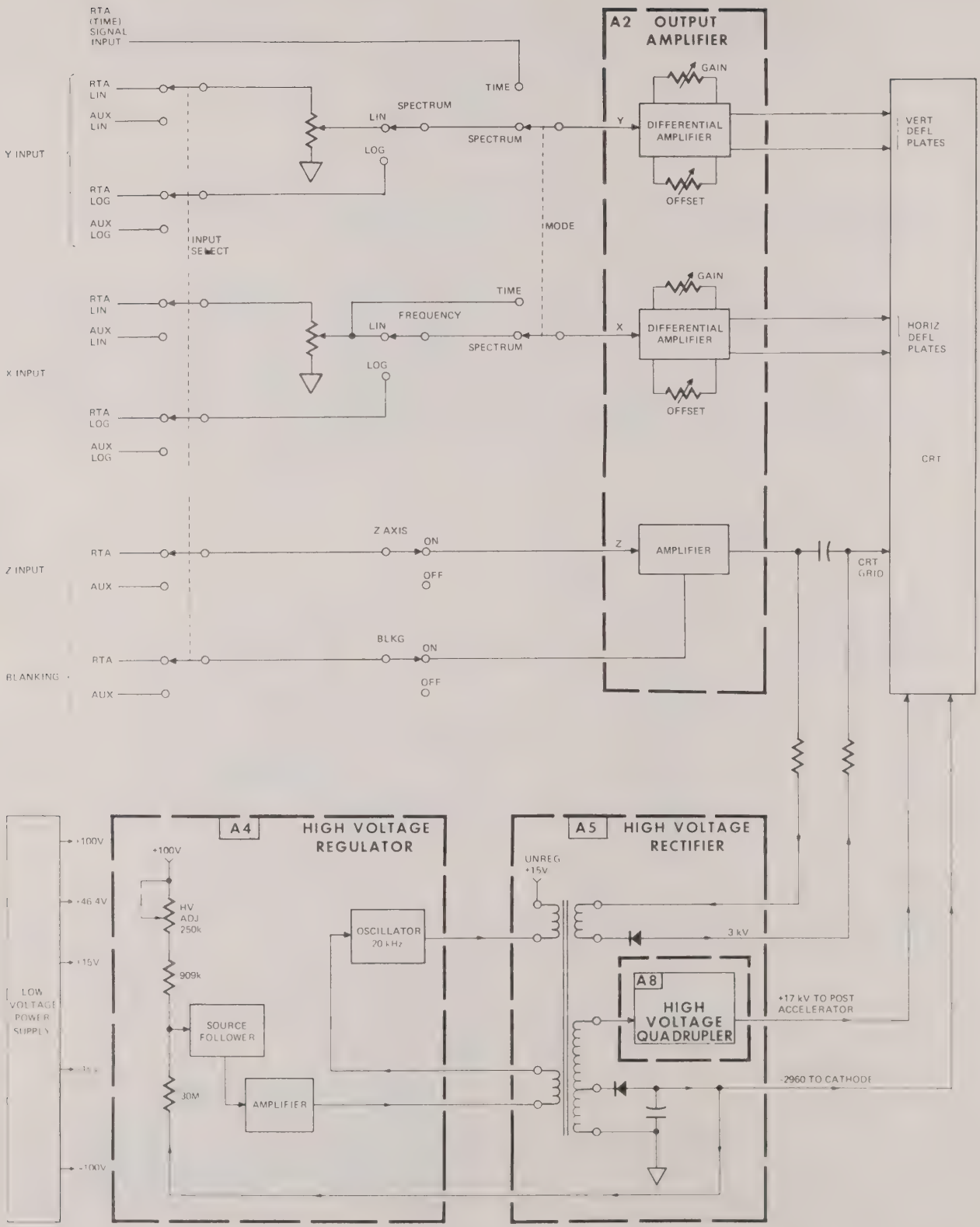


Figure 3-2. Detailed Block Diagram – Model 13116-2A X-Y Display

3.2 DETAILED BLOCK DIAGRAM DESCRIPTION (See Figure 3-2.)

3.2.1 Input Signals Switching

All X, Y, Z, and BLANKING inputs applied to the rear-of-chassis connectors are routed to appropriate contacts of the MODE switch. The selected RTA or AUX X and Y inputs are then routed to the SPECTRUM and FREQUENCY switches where either the LOG or LIN inputs are selected.

Because the X and Y output amplifier channels have approximately equal gain, adjustable voltage dividers are included in each LIN input circuit to normalize the 5V full-scale LIN input to the 1V full-scale LOG inputs. The potentiometers are adjusted at the factory to provide the proper 5:1 ratio for use with the SD301 series of Real Time Analyzers. The selected LIN or LOG SPECTRUM and FREQUENCY signals are routed to the output amplifier via the SPECTRUM/TIME MODE switch. The selected RTA or AUX Z AXIS and BLANKING signals from the INPUT SELECT switch are separately controlled (ON or OFF) by their associated toggle switches.

With the front-panel MODE switch set to SPECTRUM, the selected LIN or LOG SPECTRUM and FREQUENCY inputs are routed to the Y-axis and X-axis channels of the output amplifier. If TIME MODE is selected, the RTA SIGNAL INPUT (J111) is applied to the Y-axis amplifier; the RTA LIN (J101) or AUX LIN (J106) signal, as selected by the INPUT SELECT switch, is applied to the X-axis output amplifier.

3.2.2 Output Amplifier (See Figure 3-2.)

The output amplifier contains two identical amplifier channels, each with associated GAIN and OFFSET controls, which provide the X-axis and Y-axis deflection signals for the CRT. These amplifiers accept the single-ended X and Y input signals and provide differential outputs for driving the CRT horizontal and vertical deflection plates. The Z-axis output amplifier is single-ended; its output is applied to the CRT grid to control the intensity of the display.

3.2.3 Low Voltage Power Supply (See Figure 3-3.)

The low voltage power supplies provide regulated +100V, −100V, +15V, and −15V for the operation of all circuits in the Model 13116-2A. The +100V regulated and a +15V unregulated output are used to power the circuits of the high voltage power supply described in Paragraph 3.2.4. The regulated +100V is further reduced (and regulated) to provide +46.4V for the CRT accelerator electrode.

The 115/230V, 50–400 Hz a-c input power is fused and filtered, and routed through the front-panel POWER push button switch to power transformer 1T1. The rear-chassis 115/230 slide switch facilitates connecting the primary windings of 1T1 in parallel for 115V operation or in series for 230V operation. The multiple secondary windings of 1T1 supply the full-wave bridge type rectifier circuits.

Conventional solid-state diode rectifiers and electronic voltage regulators are used to provide all d-c operating voltages. The +100V supply is referenced to a glow tube. The −100V supply is referenced to the output of the +100V supply. Both the −15V and +15V supplies are referenced to the output of the −100V supply.

3.2.4 High Voltage Supply (See Figure 3-2.)

The high voltage supply comprises the high voltage regulator and rectifier boards and the quadrupler. This supply generates the −2.95 kV, −3 kV, and +17 kV for the CRT. The −2.95 kV is sensed by a 30:1 divider and the resultant voltage is referenced to the regulated +100V. Deviations from zero volts (at the divider junction) are amplified and applied to the oscillator. The oscillator produces a sine wave signal of approximately 20 kHz that drives the primary of the HV transformer.

The secondary voltages are diode rectified and filtered to provide a "floating" −3 kV grid supply and a −2.95 kV cathode supply. One winding supplies the quadrupler which produces the +17 kV post accelerator voltage.

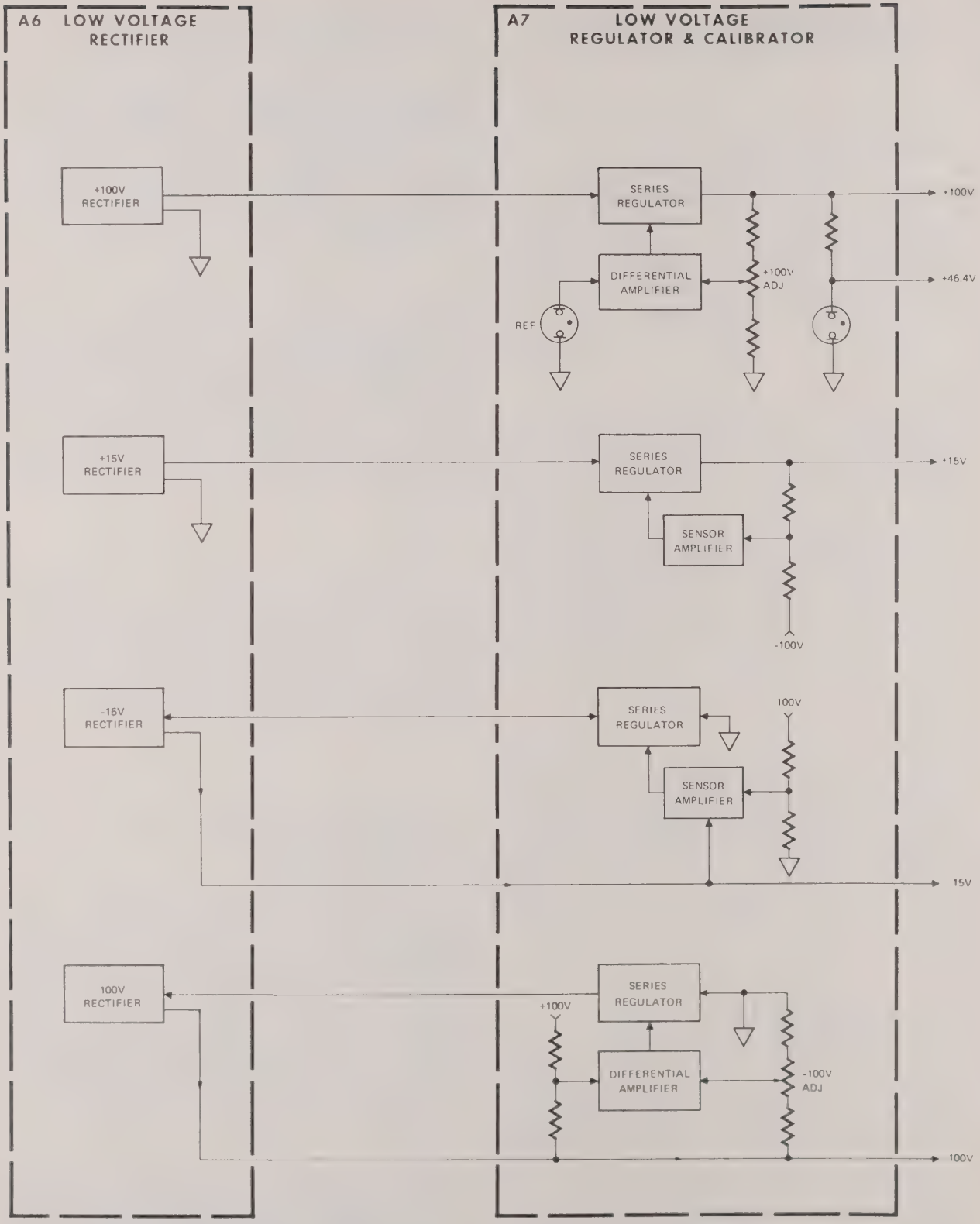


Figure 3-3. Detailed Block Diagram — Low Voltage Power Supply

SECTION IV

CALIBRATION AND MAINTENANCE

4.1 GENERAL

The following procedures are pertinent to the low voltage and high voltage power supplies; no other adjustments are required. Table 4-1 lists the test equipment required; test equipment having equal or better operating characteristics may be substituted.

NOTES

1) In general, calibration of this instrument should not be performed unless a definite problem exists and/or maintenance has required the replacement of components.

2) Correct operation of the high voltage power supply is dependent on the proper output voltages from the low voltage supply.

3) To perform the calibration, the instrument must be operative. If not, the problem must first be isolated and repaired before any section can be calibrated.

4.2 CALIBRATION

4.2.1 Preliminary Setup

a. Place the Model 13116-2A on a test bench. (It need not be connected into a system configuration for this procedure.)

b. Set the front-panel controls as follows:

INTENSITY	10 o'clock
X-AXIS GAIN	Maximum Clockwise
Y-AXIS GAIN	Maximum Clockwise
X-AXIS OFFSET	Center of Travel
Y-AXIS OFFSET	Center of Travel

c. Apply power to the Model 13116-2A and all test equipment; allow a 15-minute warmup.

Table 4-1. Test Equipment Required

Name	Model No.	Manufacturer
DC VTVM	410B	Hewlett-Packard
Voltage Divider (100:1)	11044A	Hewlett-Packard
Voltage Calibrator	738BR	Hewlett-Packard
Sweep Oscillator (Signal Generator)	SD104A	Spectral Dynamics
Monitor Oscilloscope	H-P180A w/1801A	Hewlett-Packard

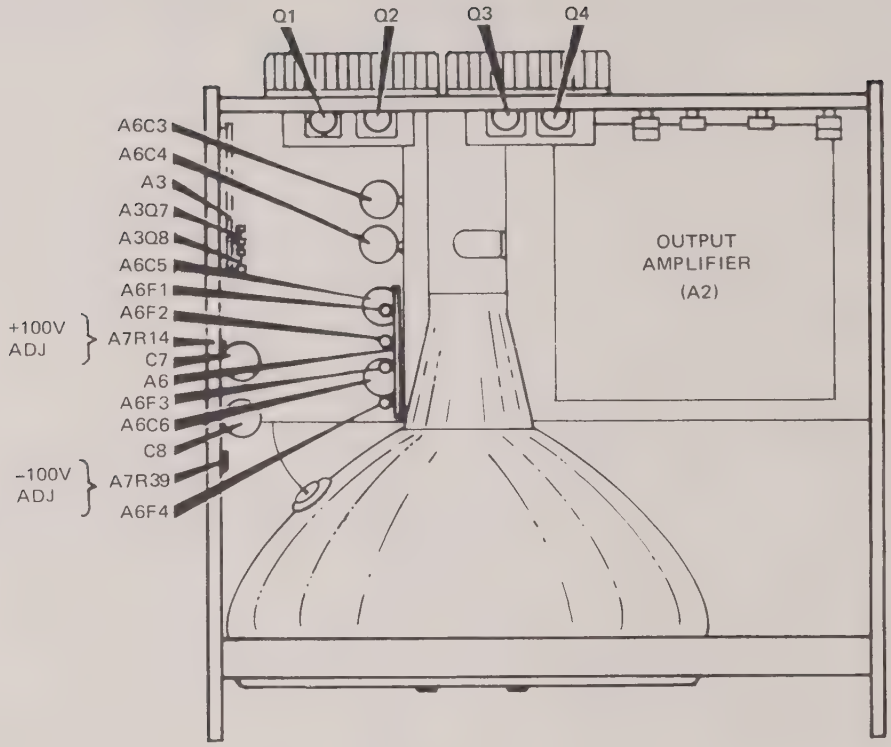


Figure 4-1. Chassis Top View — Low Voltage Adjustments

4.2.2 Low Voltage Power Supplies (See Figure 4-1.)

a. Remove the instrument top cover.

b. Connect VTVM to A7TP1, the +100V test point on circuit card A7. Adjust A7R14 for +100V reading.

c. Connect VTVM to A7TP5, the -100V test point on circuit card A7. Adjust A7R39 for 100V reading.

d. Check the +15V supply at A7TP3 and the -15V supply at A7TP4. Both voltages should be within ±0.3V of the nominal ±15V.

e. Replace the top instrument cover.

4.2.3 High Voltage Power Supply (See Figure 4-2.)

WARNING

The voltages being measured in the high voltage supply are dangerous to life. To prevent transference of high voltage outside of the instrument, a 100:1 high voltage divider probe must be used on the end of the VTVM d-c probe.

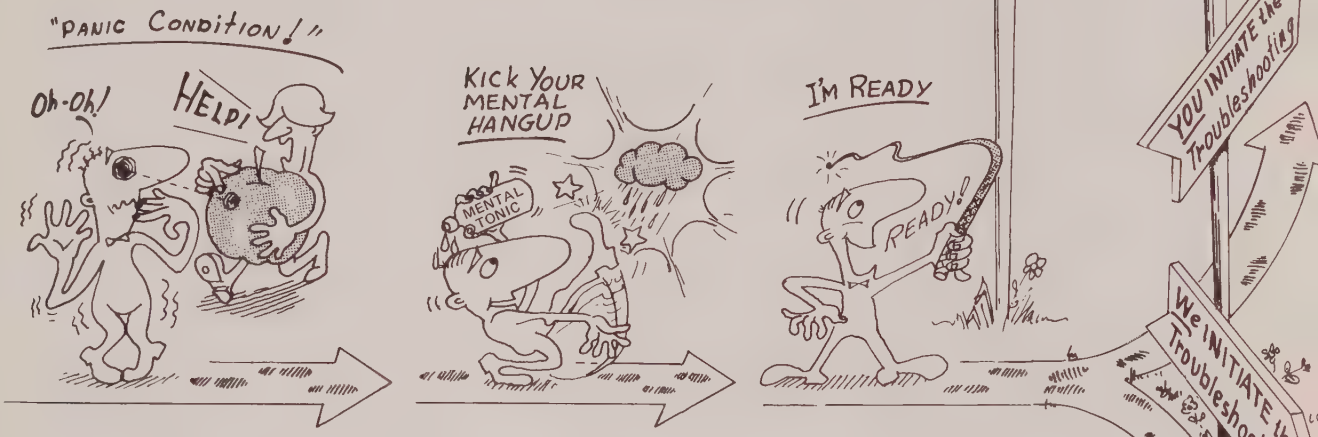
NOTE

All voltage readings given in the following adjustment procedure assume the use of a 100:1 divider probe.

a. Rest instrument on its side and remove the bottom cover.

b. Connect the 100:1 divider probe to the d-c probe of the VTVM.

TROUBLESHOOTING ON EASY ST.



PANIC THOUGHTS

- I've never seen this one before!
- Does anybody know how it happened?
- They probably need it fixed yesterday!
- Who can I ask for help?

POSITIVE APPROACH

- Problem is probably simple.
- I can fix this problem easily.
- I am going to think logically.
- I am going to carefully evaluate the front panel indications.
- I'll talk to the person who had the problem.

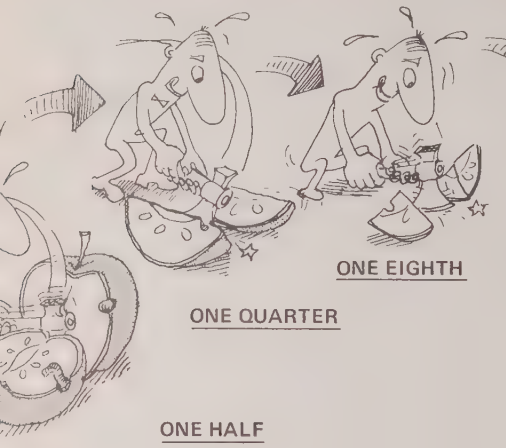
READY

- I can whip the problem NOW.

PREPARATION FO

- Have talked to per
  experienced the pr
- Have read the man
- Have complete Mo
  Numbers from rea

SUCCESSIVE HALF-SPLIT TROUBLESHOOTING METHOD

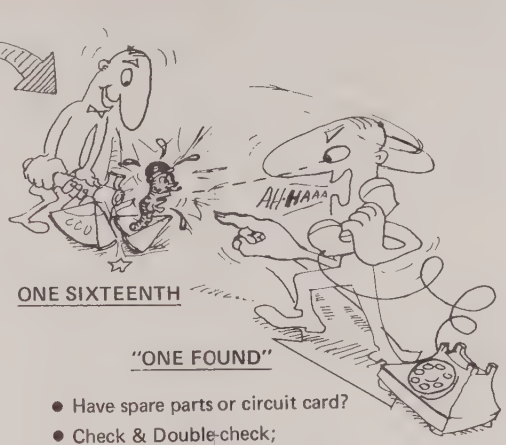


ONE EIGHTH

ONE QUARTER

ONE HALF

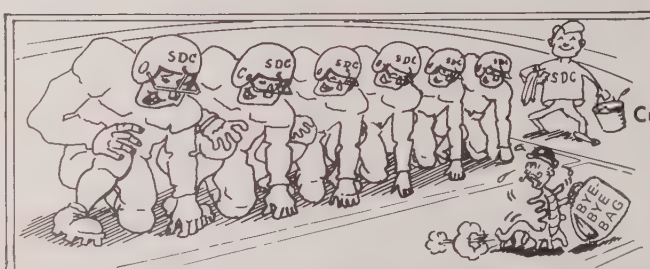
- Evaluate front panel symptoms before removing cover.
- Look for obvious—simple problem.
- Do not adjust to "FIX" problems!



ONE SIXTEENTH

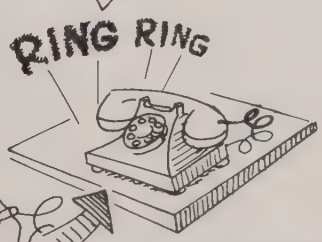
"ONE FOUND"

- Have spare parts or circuit card?
- Check & Double-check; then order parts.
- Prepare for call:
  Have correct part number from part or schematic.
  Have complete Model and Serial Numbers from rear of chassis.



The SDC
Customer Service Team
is
At Your Service
Aiming To Please

SERVICE IS OUR BUSINESS



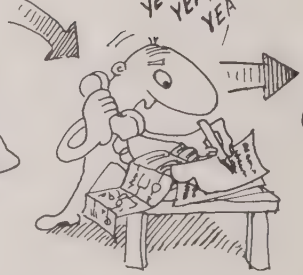
WE CALL BACK

- To Check & Double-check

CALL

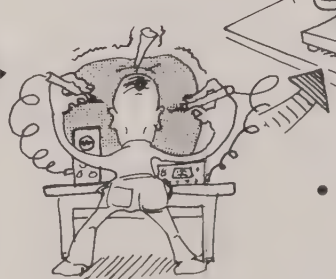
who
lem.

and Serial
chassis.



YOU CALL FOR INSTRUCTIONS

- We spell out tests.



YOU PERFORM CHECKOUT

- As instructed

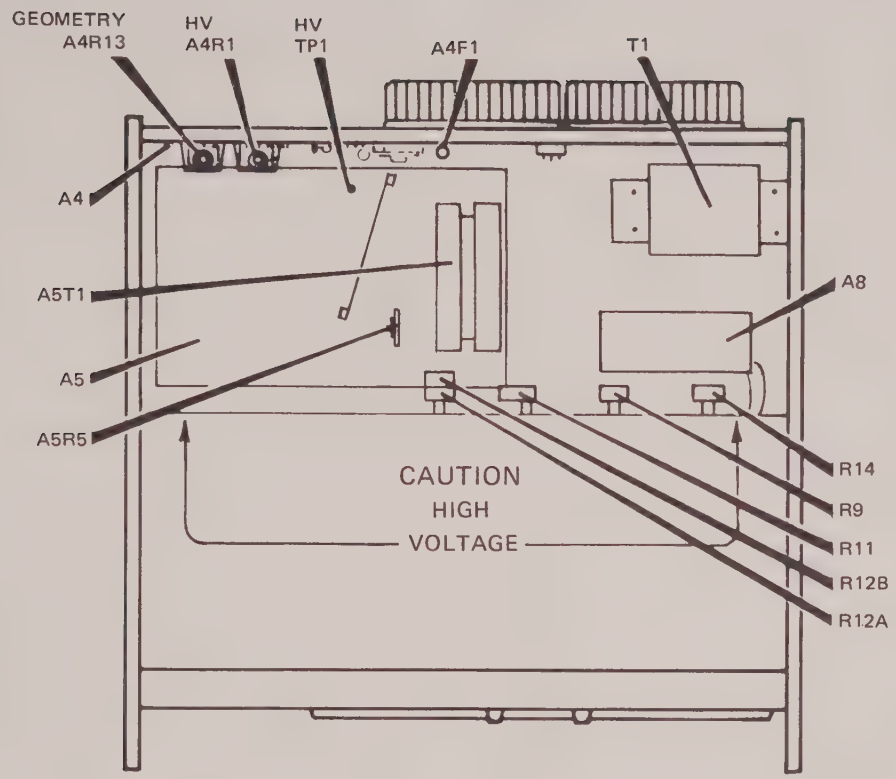


Figure 4-2. Chassis Bottom View — High Voltage Adjustments

c. Set VTVM to the –3 Vdc range.

d. Set voltmeter calibrator to –300 Vdc output.

e. Touch divider tip to output of the calibrator and adjust the VTVM gain to give a VTVM reading of –3V.

f. Set VTVM to –30 Vdc range.

g. Observe WARNING and touch end of 100:1 divider probe to the HV test point on circuit card A5.

h. Adjust A4R1 (HIGH VOLTAGE ADJ) for –29.5V reading on VTVM.

i. Remove the divider probe from the HV test point; remove the divider probe from the end of the VTVM d-c probe; and recalibrate VTVM as necessary.

4.2.4 Intensity Limit Adjustment

No test equipment is required for this adjustment. However a focused spot must be visible on the CRT.

a. Adjust the front-panel INTENSITY control to 9 o'clock.

b. Observe WARNING on bottom of chassis, and on circuit card A5, adjust A5R5 (INTENSITY LIMIT) to just extinguish the spot.

4.2.5 Geometry Adjustment

(Two signal generators are required for this adjustment.)

a. On the Model 13116-2A, set both front-panel FREQUENCY and SPECTRUM selectors to LOG position.

b. Connect the variable output of a signal generator to the LOG Y-INPUT; adjust for 50 kHz.

c. Connect the variable output of a second generator to the LOG X-INPUT; adjust for 10 kHz.

d. Adjust the output levels of the signal generators to obtain the largest, solid, square pattern possible without going outside the graticule edge lines.

e. Observe the shape of the raster on the Model 13116-2A CRT (also WARNING on bottom of chassis) and adjust A4R13 (GEOMETRY) to obtain the squarest display with the least distortion at the vertical and horizontal edges.

4.2.6 Display Normalization

To perform this procedure, the particular SD301 to be used in the system is required. This procedure is used to normalize the full-scale displays of the SPECTRUM LOG to the SPECTRUM LIN, and the FREQUENCY LOG to the FREQUENCY LIN.

a. Connect the SPECTRUM LIN/LOG and FREQUENCY LIN/LOG outputs of the SD301 to the Model 13116-2A inputs.

b. Place the SPECTRUM switch to LOG and the FREQUENCY switch to LOG.

c. Using the SD301 FREQ-CAL switch and the Model 13116-2A X-AXIS GAIN/OFFSET controls, display two decades of frequency.

d. Remove the Model 13116-2A top cover.

e. Place the SD301 FREQ-CAL switch to F.S. The dot should appear at full scale.

f. Place the Model 13116-2A FREQUENCY switch to LIN position. Adjust R4 (behind FREQUENCY switch) so that the dot appears at full scale. This completes the X-axis normalization.

g. Using the SD301 SPECTRUM-CAL switch and the Model 13116-2A Y-AXIS GAIN/OFFSET controls, calibrate the Y-axis for 10 dB/inch.

h. Place the SD301 MODE switch to MAN position, the function switch to SPECTRUM-CAL 0-dB, and position the dot at full scale.

i. Place the Model 13116-2A SPECTRUM switch to LIN position. Adjust R1 (behind SPECTRUM switch) so that the dot appears at full scale. This completes the Y-axis normalization.

This completes the calibration procedure. Remove power and all test equipment, replace the top and bottom covers, and place the instrument in service.

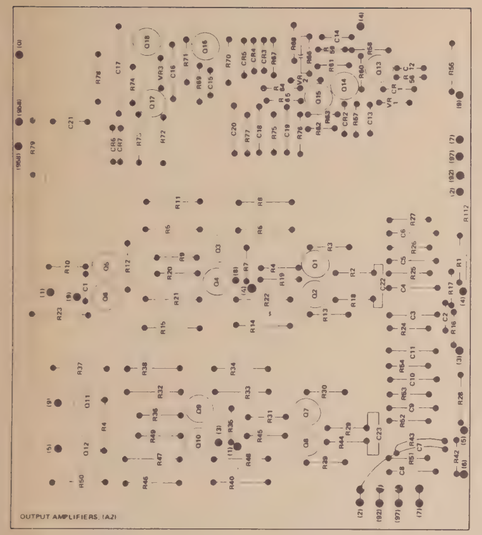
4.3 PARTS REPLACEMENT

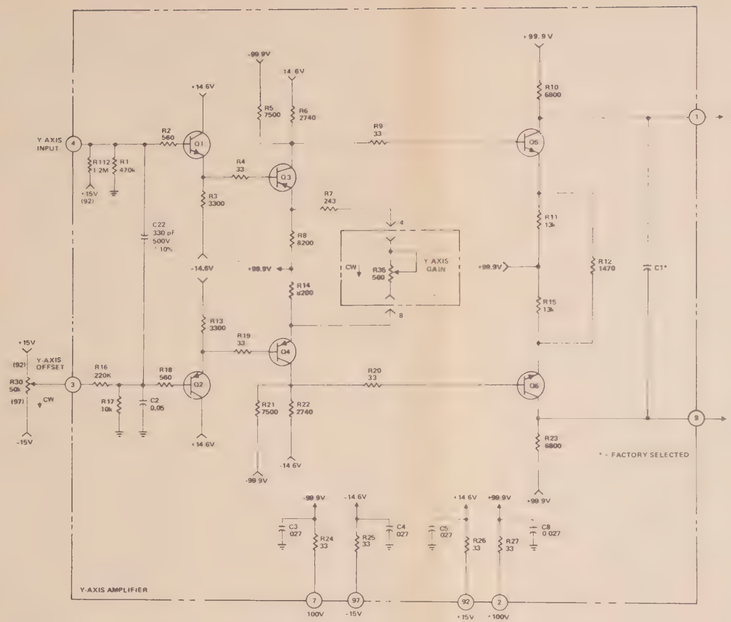
Except for some special SDC specification-controlled parts listed in Table 4-2, which must be ordered from Spectral Dynamics Corporation, standard electronic parts have been used throughout the instrument. Spectral Dynamics Corporation maintains a complete stock of the printed circuit card assemblies used in this instrument.

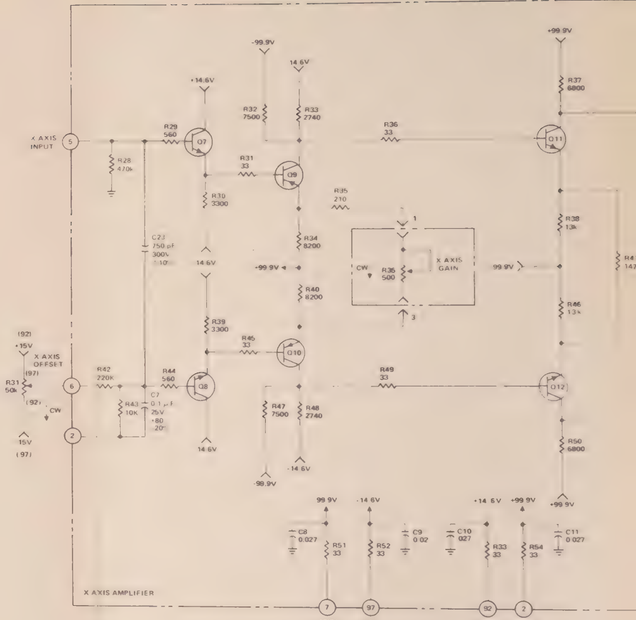
When ordering a replacement part or assembly, be sure to include the reference designator, the part number of manufacturer's designation, and a complete description; include also the instrument name, model number, and serial number.

Table 4-2. Special Replaceable Parts List

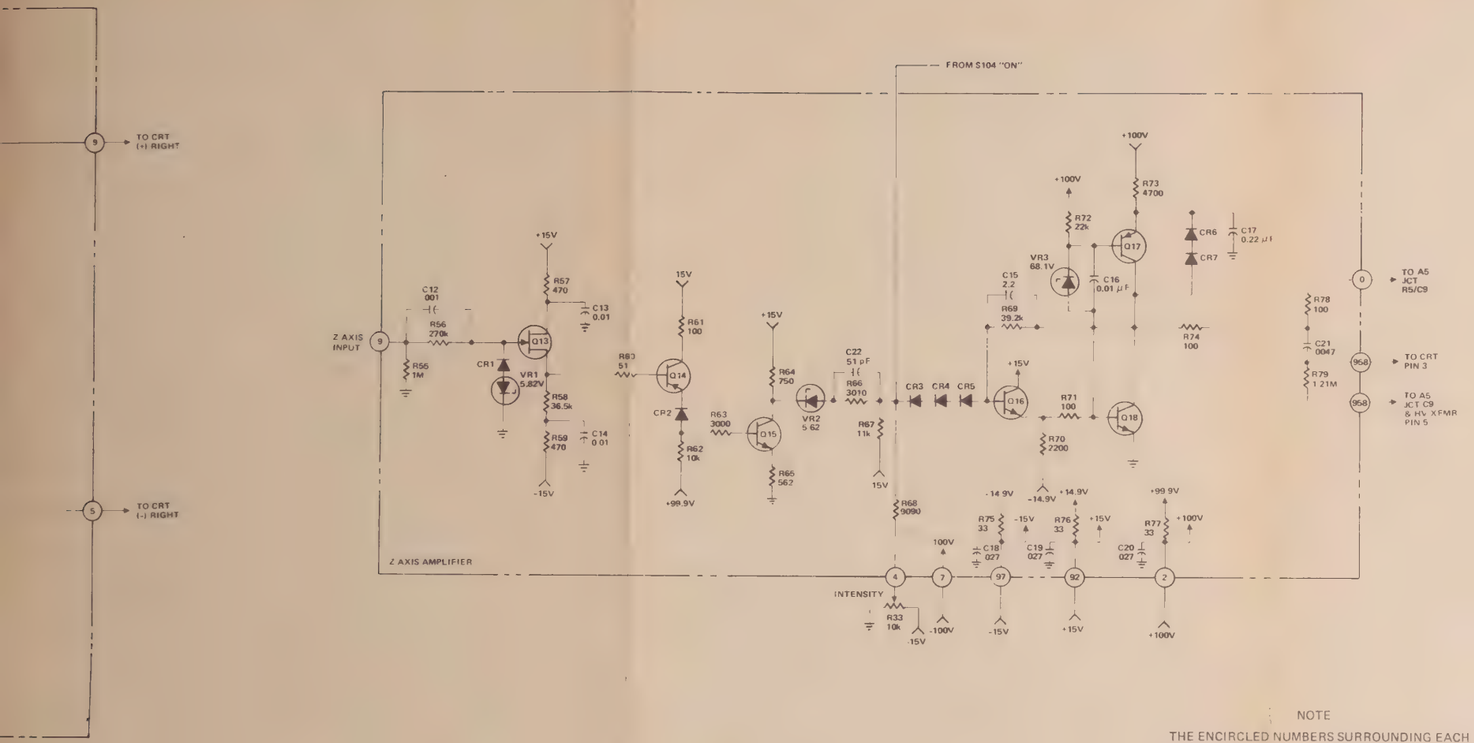
Reference Designator	Description	Part Number/ Mfr. Designation
A2	Circuit Card, Output Amplifier	10065900
A4	Circuit Card, HV Regulator	01300-66501
A5	Circuit Card, HV Supply	10066000
A6	Circuit Card, LV Rectifier	10066100
A7	Circuit Card, LV Regulator	01300-66510
V1	X-Y Display Tube	5083-1752
	Knob, SPECTRUM, FREQUENCY LIN/LOG	20013-175
	Knob, X-AXIS GAIN, OFFSET	20013-175
	Knob, Y-AXIS GAIN, OFFSET	20013-175


OUTPUT AMPLIFIERS (A2)


Y AXIS INPUT
Y AXIS OFFSET
Y AXIS GAIN
TO CRT (+) UP
TO CRT (-) UP
* - FACTORY SELECTED
Y-AXIS AMPLIFIER


X AXIS INPUT
X AXIS OFFSET
X AXIS GAIN
X AXIS AMPLIFIER

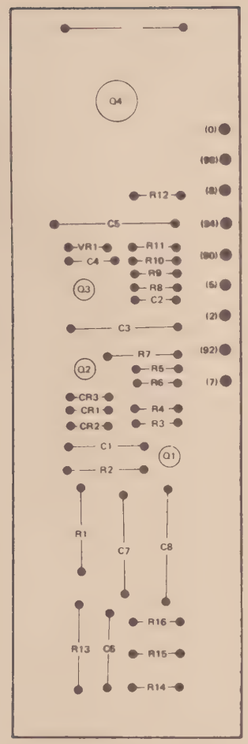
REVISIONS						
REV	ECO	S/N	DESCRIPTION	DRAFT	APP'D	DATE
A		011	REDRAWN	GBC 4/73		



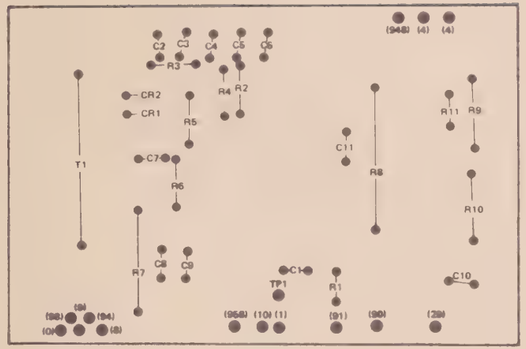
NOTE

THE ENCIRCLED NUMBERS SURROUNDING EACH AMPLIFIER SCHEMATIC REPRESENT WIRE COLOR CODING. CORRESPONDING NUMBERS APPEAR IN PARENTHESIS ON THE CIRCUIT CARD COMPONENT LAYOUT.

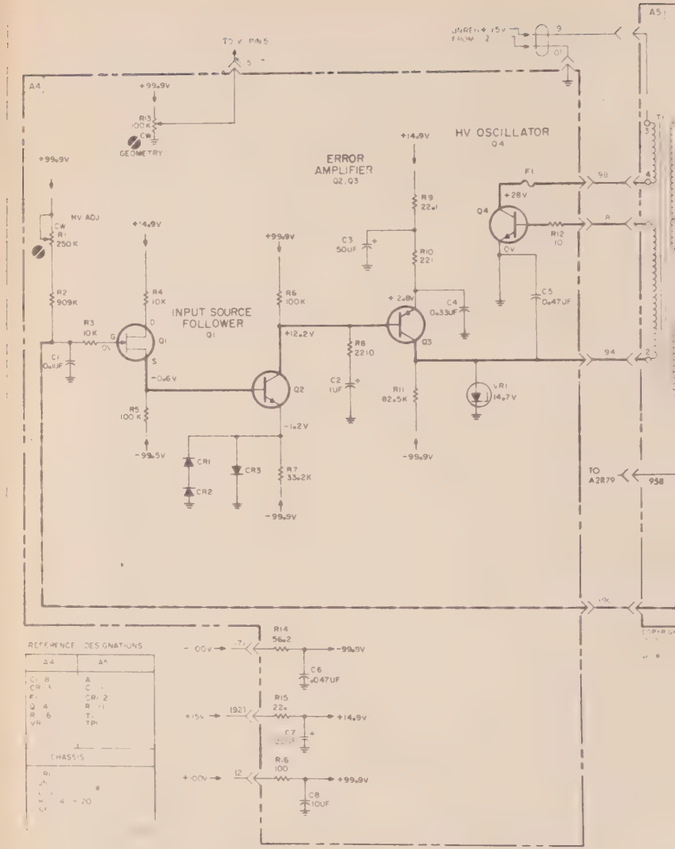
SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO			TITLE: SCHEMATIC/COMPONENT LAYOUT OUTPUT AMPLIFIERS ASSEMBLY 10028400		A2
DRAWN	G. CLARE	4-17-73	MODEL: 13116-2A	SIZE:	DRAWING NO: 10065900
DESIGNER					REV: A
CHECKED					
ENGINEER		4-18-73	SCALE		SHEET 1 OF 1
APPROVED					

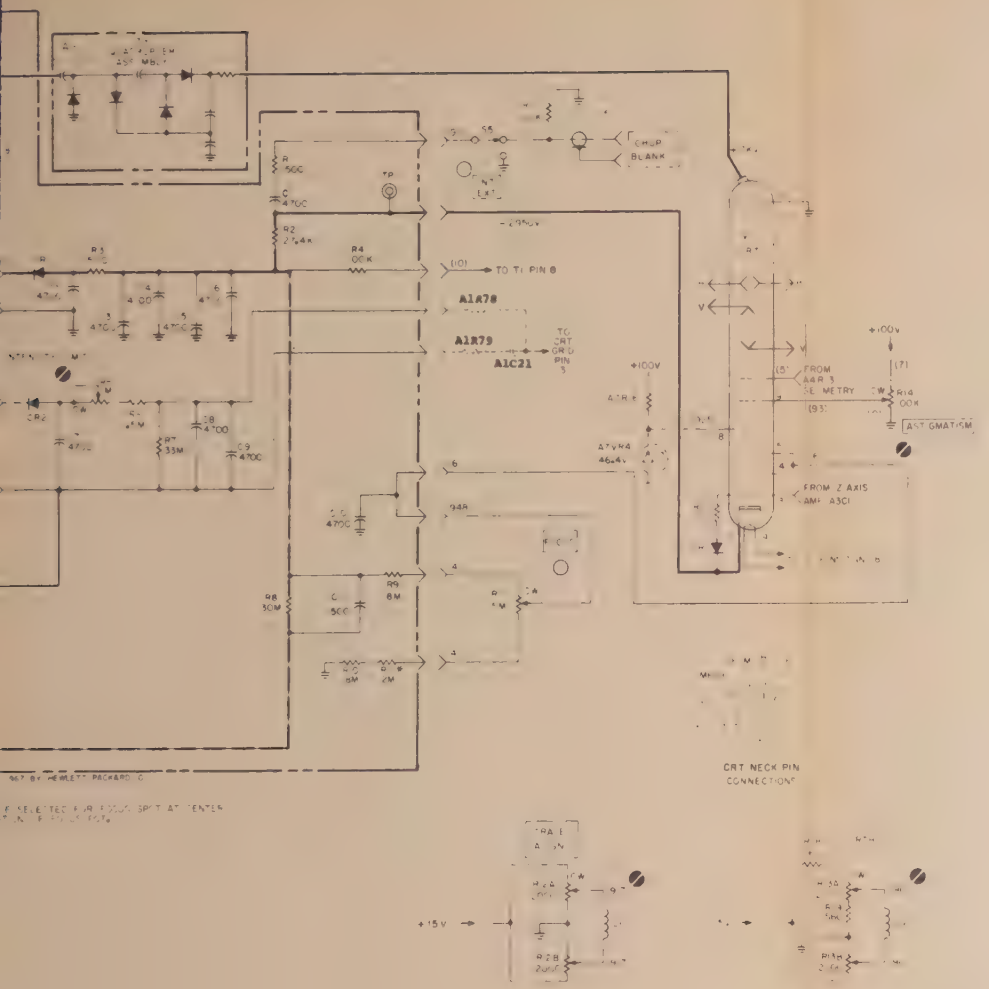


HIGH VOLTAGE REGULATOR (A4)



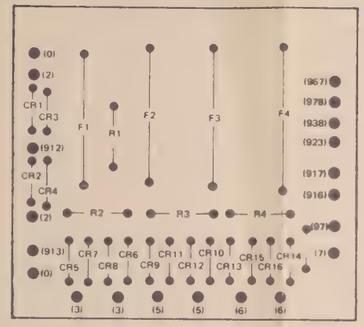
HIGH VOLTAGE RECTIFIER (A5)



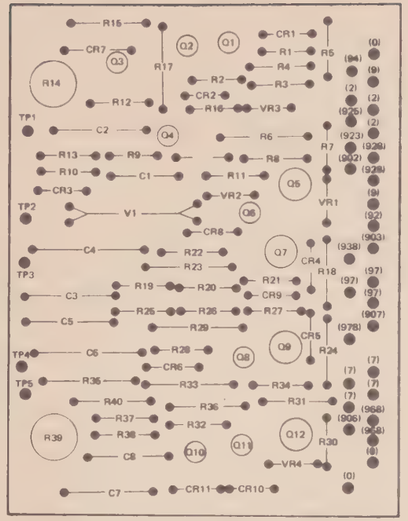


REVISIONS						
REV	ECO	S/N	DESCRIPTION	DRAFT	CHECK	APP'D
A			REDRAWN	L. S. 4-73		

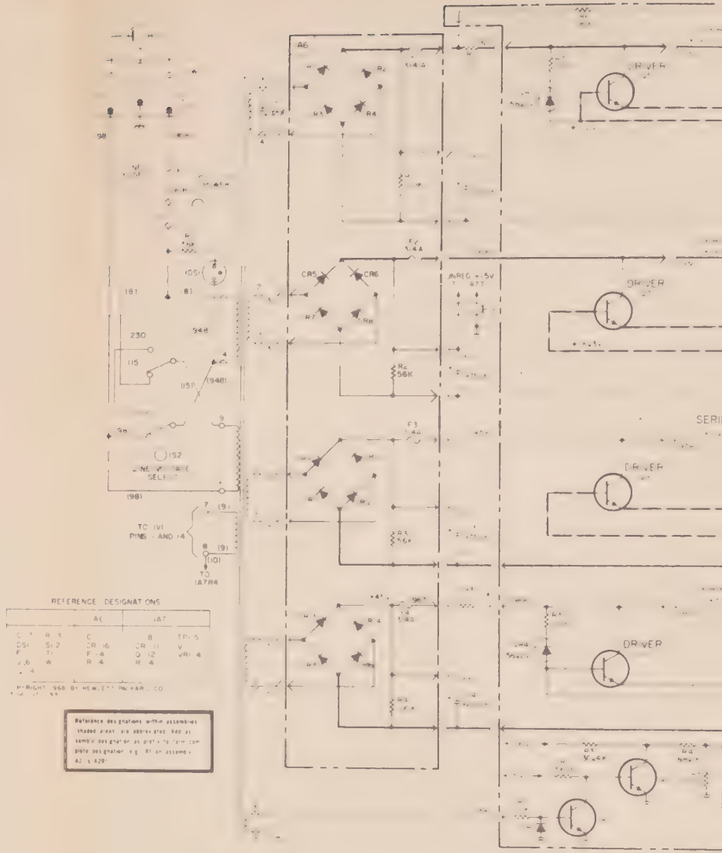
SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO			TITLE: SCHEMATIC/COMPONENT LAYOUT HIGH VOLTAGE POWER SUPPLY (Ckt Cards A4, A5 & Ckt A8)			
DRAWN	L. SAUER	4-73	MODEL 13116-2A	SIZE	DRAWING NO. 10066000	REV A
DESIGNER						
CHECKED						
ENGINEER			SCALE		SHEET 1 OF 1	
APPROVED						

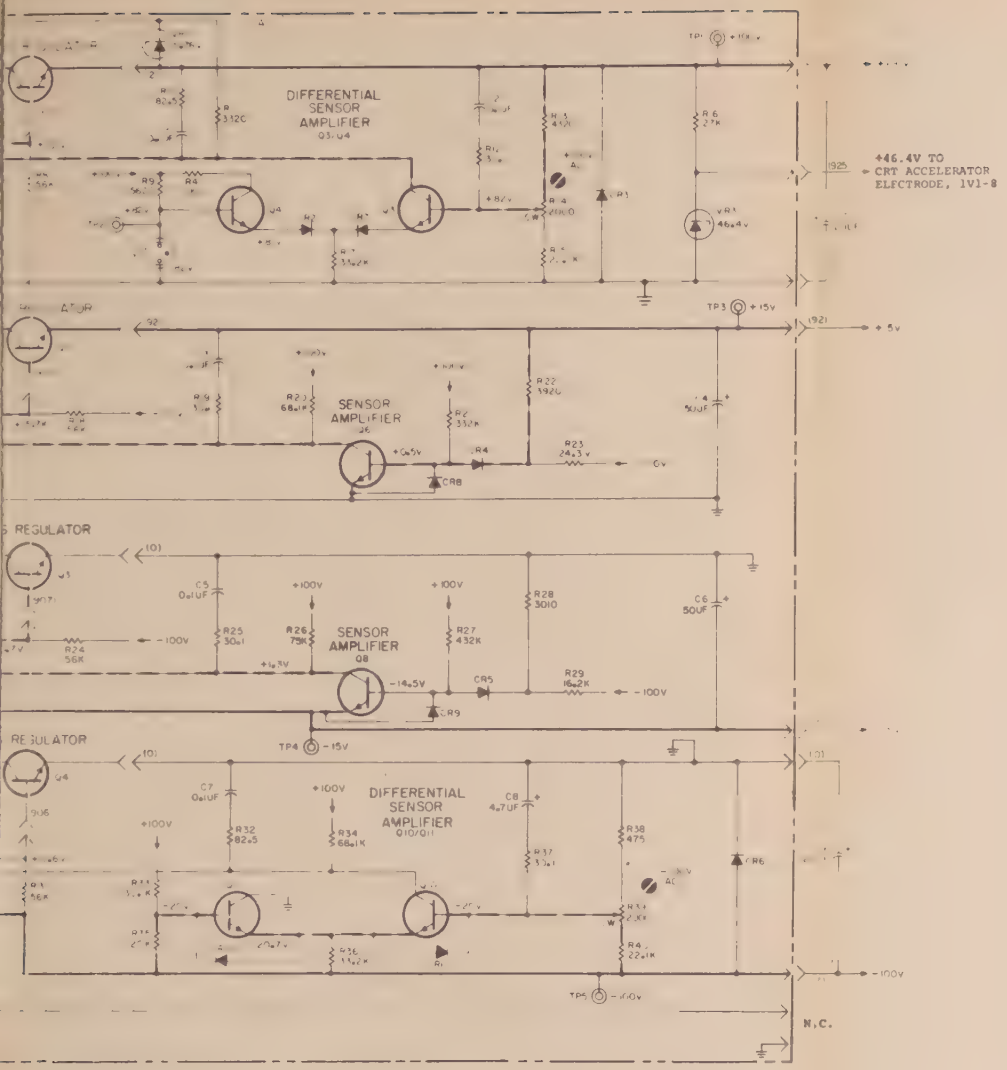


LOW VOLTAGE RECTIFIER (A6)



LOW VOLTAGE REGULATOR (A7)

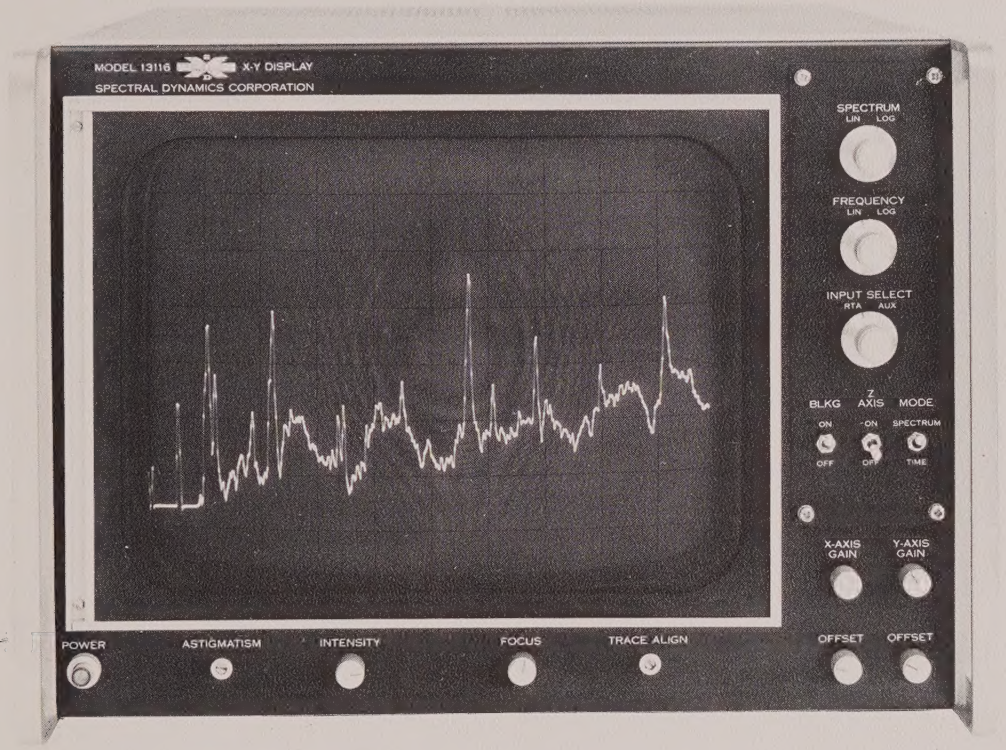




REVISIONS						
REV	ECO	S/N	DESCRIPTION	DRAFT	CHECK	APP'D
A			REDRAWN	L. S. 4-73		

SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO			TITLE: SCHEMATIC/COMPONENT LAYOUT LOW VOLTAGE POWER SUPPLY (Ckt Cards A6, A7)			
DRAWN	L. SAUER	4-73	MODEL: 13116-2A	SIZE:	DRAWING NO.: 10066100	REV: A
DESIGNER						
CHECKED						
ENGINEER						
APPROVED			SCALE		SHEET 1 OF 1	

MODEL 13116-2A
X-Y DISPLAY



GENERAL DESCRIPTION

The Model 13116-2A X-Y Display is a high resolution, large screen oscilloscope for use with Spectral Dynamics Real Time Analyzers such as the SD301C, SD320 and SD330. Switch-selectable dual inputs and multiple signal controls make the Model 13116-2A an extremely convenient system accessory.

Front panel controls make it possible to switch inputs from an SD301 series Real Time Analyzer to an auxiliary unit such as an SD305A (1/3 Octave Converter), SD308 (Signature Ratio Adapter), etc. In this way, the operator is spared the task of changing rear panel input connectors each time he wishes to change the manner in which he is processing data.

Linear and logarithmic inputs for both the Spectrum and Frequency axes are accepted and available for display by switch selection. A Z-axis input is also provided. All the standard scope controls are conveniently located on the front panel.

Other front panel switches provide controls for: (1) retrace blanking, on or off; (2) Z-axis input, on or off; and (3) selection of the raw input signal (time history).

The output display is presented on a high resolution 8" x 10" CRT. Fast response speed and good linearity provide an undistorted display of real time or averaged spectra.

The Model 13116-2A does not contain a fan; external cooling is recommended and may be required, particularly if installed in a confined area.

SPECTRAL DYNAMICS CORPORATION OF SAN DIEGO
POST OFFICE BOX 671, SAN DIEGO, CALIFORNIA 92112
TELEPHONE 714—278-2501 • TWX 910-335-2022
June 1973
S-027

SPECIFICATIONS*

INPUTS

SINGLE INPUT . . . . . Data signal (time history)

DUAL INPUTS

From RTA . . . . . Spectrum lin and log
Frequency lin and log

From AUX . . . . . Spectrum lin and log
Frequency lin and log

From RTA and AUX . . . . . Z input: +1V for full intensity
−1V for blanking

Blanking: accepts open circuit signal for normal CRT intensity or +5V for retrace blanking

SETTLING TIME . . . . . Less than 7 μs to within a trace width of final value.

REPEATABILITY . . . . . Less than 0.15% error for re-addressing a point from any direction.

LINEARITY . . . . . ±1% of full screen over 8 x 10-inch screen; any inch with respect to any other inch, within 10%.

CATHODE RAY TUBE

Accelerating Potential . . . . . 20 kilovolts

Writing Rate . . . . . Greater than 20 inches per μs

Spot Size . . . . . Less than 30 mils throughout 8 x 10-inch screen at 100 foot-lamberts light output; nominally 20 mils at center screen (shrinking raster).

Phosphor and Graticule . . . . . Aluminized P31 phosphor with 8 x 10-inch graticule.

CONTROLS, FRONT PANEL . . . . . Push button POWER on-off switch; screwdriver adjust ASTIGMATISM, TRACE ALIGN; control knobs for X-AXIS GAIN and OFFSET, Y-AXIS GAIN and OFFSET, INTENSITY and FOCUS; rotary switches for SPECTRUM LIN/LOG, FREQUENCY LIN/LOG, and INPUT SELECT RTA/AUX selection; toggle switches for BLKG ON/OFF, Z-AXIS ON/OFF, and MODE SPECTRUM/TIME.

COOLING . . . . . The Model 13116-2A does not contain a fan; therefore, if it is installed in a confined area such as a rack containing other equipment, external cooling is recommended and may be required.

POWER . . . . . 105−125/210−250 Vac (switch selectable); 50 to 400 Hz, approximately 175 watts

DIMENSIONS . . . . . Height . . . . . 31,12 cm (12-1/4")
Width . . . . . 42,55 cm (16-3/4")
Depth . . . . . 47 cm (18-1/2")
Shipping Weight . . . . . 29,03 kg (64 lb)

ACCESSORIES SUPPLIED . . . . . Power cord, rack mounting tabs and two instruction manuals.

*Specifications subject to change without notice.